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AUTHOR Winston, Carl M.
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ABSTRACT

A 6-week summer program provided 51 gifted 4th and 5th graders with nonstructured experience in problem solving in science and language arts and in satisfying of operant needs. Fifty one matched children served as controls. Divided into four groups, the children worked with four teachers acting primarily as resource consultants. Testing demonstrated no significant differences between subjects and controls in problem solving in either science or language arts; however, children in the program manifested a reduced total need operancy. Changes in problem solving ability and operant need level were related only in the area of language arts; selection factors were related to success only in so far as subjects from grade 4 or with lower arithmetic reasoning did better. (JD)

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MEETING NEEDS OF GIFTED:

A NON-STRUCTURED SUMMER PROGRAM

1962-1963 School Year

Report Submitted by:

Carl M. Winston, Ph.D.
Principle Investigator

Central School District No. 4
Administration Building
Plainview, New York

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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MEETING NEEDS OF GIFTED:
A NON-STRUCTURED SUMMER PROGRAM

I. STATEMENT OF THE PROBLEM UNDER STUDY

The general purpose of this study was to determine in what way gifted children could profit from a six-week summer program for pupils in the fourth and fifth grades in the Plainview-Old Bethpage Central School District No. 4. More specifically, this study attempted to evaluate both the type of child who could benefit from such a program and some of the gains derived from this type of experience. This summer program was designed to develop increased ability in problem-solving techniques in the areas of Science and Language Arts. Emphasis was also placed on satisfying the operant-needs of these children.

It was the intent of this study to determine which needs could be satisfied when the instructional program is freed from the usual structural and organizational limitations that are part of the regular school curriculum. In the summer program such structure was minimized within the areas of Science and Language Arts in order to provide for the flexibility necessary to implement this program. The instructional program was directed towards giving children considerable independent experience in problem-solving techniques.

In this study the assumption was made that gifted children have the intellectual ability to develop problem-solving approaches if they are provided with adequate experiences in school and receive proper guidance from their teachers. However, it was felt that in addition to the proper approach necessary in problem-solving of all

kinds there was a need to encourage and assist gifted children to follow through in their learning experiences by planning carefully, obtaining adequate information, organizing and producing results of a high level.

The philosophy of education for the Plainview-Old Bethpage School District in meeting the needs of all children stresses recognition of individual differences in academic ability, achievement and personal needs. Since no specific program had existed for the gifted in this district, there was a definite need for such a program. Numerous examples existed of children of above-average ability who were not being sufficiently challenged by the present curriculum. One attempt to resolve this problem had been made by the use of acceleration. In many individual cases this had not proven completely satisfactory. A recent survey had indicated that the professional staff within the Plainview-Old Bethpage School District had shown the need for additional learning opportunities for this type of child. It has been further observed that when some additional provision such as science fairs, school publications, etc., have been made available to these children they have responded with enthusiasm and excellent performance. The summer program offered children the opportunity for individualized learning experiences.

When this summer program was described to the faculties of the elementary schools approximately 250 of 12% of the children in the fourth and fifth grades were recommended by their teachers as possible candidates who could profit from such a program. The question arose as to which of the gifted children would profit

most from this approach. In the initial phase of this study selective factors were limited to the usual available school data (I.Q., age, sex, achievement scores.) It was hoped that additional information regarding the appropriate types of selection factors could be determined as a result of studying the children involved in the summer program.

There is a paucity of research results on programs above and beyond the school year for gifted children.

> "Studies and surveys make it clear that the typical elementary school provides a too meager and restricted curriculum for the gifted. In many schools the abilities of gifted children are unrecognized; and in others they are unchallenged or neglected. Most educators stress the desirability of offering such pupils broad and diversified educational opportunities."(9)

It is felt that the findings obtained as a result of this study may be applicable to the education of the gifted in other school districts and even to children in general.

DEFINITIONS OF TERMS

1. Gifted -- The term "gifted" will refer to those children who show the greatest ability to profit from advanced academic work in a total school population. In this study it refers to the top 7% in intelligence (130 I.Q. or above.)
2. Problem-Solving Techniques in Science is defined as the ability to suggest or eliminate hypotheses, to select procedures for testing hypotheses, to interpret data and draw conclusions, to evaluate statements by others, and to reason quantitatively and symbolically. (5.)

3. Problem-Solving Techniques in Language Arts is defined as the ability to understand direct statements, to interpret and summarize passages, to see motives of authors, to observe organization of ideas and to criticize passages with respect to ideas and purposes of presentation.(6)

4. Operant Need -- The need that exists in (has been learned by) the individual and currently is not satisfied. Therefore, the need is acting as a motivator in the manner described in Murray's definition.(2)

5. Non-Operant Need -- The need is not acting as a motivator for the individual. This may be the result of either (a) the need existing for the individual, but currently being satisfied, or (b) the need not existing for the individual (having never been learned.)(2)

In the first phase of this study the following questions were answered:

1. Do gifted children in the experimental summer program develop greater ability in problem-solving techniques in the areas of Science and Language Arts than do control subjects?
2. Do gifted children in the experimental summer program manifest a reduction in their operant-need level as compared to the control group?
3. Which selection factors (age, sex, intelligence, reading comprehension, arithmetic reasoning) are related to success in the summer program?
4. Is there a relationship between changes in problem-solving ability and operant-need level in the experimental subjects?

II. DESCRIPTION OF THE YEAR'S WORK

A. The Program of Instruction

A group of fifty-one gifted children with four teachers, a director and research psychologist were involved in a six-week summer program. The hours were from 8:30 a.m. to 12:30 p.m., with a degree of time flexibility to allow for special activities such as field trips, meetings with resource people in the areas of Science and Language Arts, and for creative individual projects.

The role of instructor in this program was less that of a teacher and more that of a resource consultant. The fact that individual projects were emphasized with each individual pupil carrying on individual studies, shifted the emphasis from actual instruction simply for cognitive acquisition and direction. Every effort was made to avoid stereotyped procedures and encourage independent and creative work.

Prior to the commencement of the summer program the instructors participated in an orientation program which stressed the philosophy and approach used. Techniques and methods to guide and direct the students toward choice of problem, independent work, and individual problem-solving were emphasized.

Discussions and role-playing also contributed toward giving the instructors a common framework in relating to students. Underlying their relationships with students was an attempt to avoid ready-made answers. Focus was on the encouragement of students' reliance upon their own talents and solutions.

ORGANIZATION

The students were evenly divided into four groups, each of which was supervised by one of the teachers for attendance and record-keeping purposes. The students were informed about the rooms and teachers available for particular activities. For example, students working on microscopic, animal or other science experiments operated in the science labs. Those students who were busy with project construction worked in a room in which there were available construction material, tools and work benches. One room was set aside for writing and integrating reports. In each of the rooms there was always a teacher available for consultation and supervision. Occasionally, all the youngsters met as one group for large group activities which included guest speakers, announcements, etc. Youngsters who sought to work on group projects such as dramatic productions, debates and science projects had to secure special permission from the director to insure that the division of labor and contribution toward the end product was clearly delineated. Likewise, the long-range (six-week) projects also required the approval of the director. For the weekly project each student had an opportunity to discuss with one or more teachers the nature of the project, the goals (new information or skills he hoped to obtain) and the means to achieve this end.

Within the total framework there was a concentration on two major content areas for all children.

1. Science....In devising the science program, attention was directed towards individual research projects. They

fell within three general forms which have been adopted to accommodate the various fields of science. These were:

a. Research paper
b. Demonstration
c. Experiment

Each student chose which of these methods he wished to pursue. A list of the projects and areas investigated can be found in Appendix A.

a. Research Paper - The research papers took the form of scientific inquiry by the use of reference skills, use of source materials, review of scientific literature, etc.

b. Demonstration - Some students set up apparatus, charts, diagrams, etc. to illustrate known scientific principles which did not employ any sort of control or variables.

c. Experiment - The main difference between the demonstration, research paper and scientific experimentation was in the careful control of all factors and the employment of control factors in the experimentation.

The children's research was directed toward an intensive investigation of limited and well-defined areas. The culminating activity of the science program was a science fair, which exhibited the projects of the students.

2. Language Arts....In the area of Language Arts the underlying philosophy was to help each youngster to express himself freely. The teacher's task was to stimulate the imagination, individuality, and creativity in his students.

Both oral and written language arts were used to enable the students to pursue their topics of interest to a meaningful conclusion. More specifically, the language arts program followed two approaches:

1) Children had the opportunity to examine and study the creative works of other including fiction, poetry and drama. Opportunities were provided for the students to use resource people such as producers, actors, etc. It was hoped that this would be a source of stimulation and inspiration in directing the pupils to develop their own creative works. These projects included such areas as:

Written:

a. creative poetry

b. prose (short stories), autobiographical accounts

c. plays

d. journalism

e. reviews of books, T.V., movies, drama

f. scientific writing (experiments)

g. letter writing (to Congress, editors, etc.)

Oral:

a. story telling (experimental accounts)

b. dramatization (pantomime, puppetry, dramatic readings, plays, T.V., radio)

c. Announcement

d. social skills (telephone, apology, small talk)

e. public speaking (extemporaneous speaking, campaigning)

f. debating (etc.)

A detailed list of activities, projects, layouts, etc. can be found in the Appendix, Table XXXV.

As in the science area, a culminating activity was a final book, poetry, newspaper, articles and dramatic productions.

B. The Research Design

In this section the research design will be discussed. This includes a description of the place of research, equating of groups, description of instruments and procedures in treating the data.

a. The Setting...The facilities of the Plainview High School were made available for the summer experimental program. These included both an elementary and secondary school library, laboratories and equipment for science projects and experiments including a special botanical laboratory hothouse, an auditorium for dramatic presentations, swimming pool and other facilities of the school plant as were found necessary. Various audio-visual equipment such as films, tape recorders, opaque projectors, etc. were utilized. A complete community resource file of persons with special talents, training and jobs had been compiled by the district and was used as another resource for the program.

b. The Sample...The population of the summer program consisted of fifty-one gifted boys and girls between the ages of ten and twelve years who had completed fourth or fifth grade. In addition, a group of fifty-one subjects were selected as a control group. The two groups were matched for the following characteristics:

1) Age
2) Sex
3) Grade
4) I.Q.
5) Achievement - Reading Comprehension and Arithmetic Reasoning
6) Socio-Economic Status

Table I compares the mean age for the subjects in the experimental and control groups at each grade level.

TABLE I

Significance of Mean Difference in Age of Experimental and Control Subjects at Grade Levels

Grade	No. of Subjects	Mean Age, Months	t
4th Experimental	27	122.9	1.45
4th Control	27	125.0	
5th Experimental	24	136.0	.00
5th Control	24	136.0	

Table II describes the frequency distribution of the control and experimental population for grade and sex.

TABLE II

Distribution of Experimental and Control Subjects by Grade and Sex

Grade	Boys	Girls	Total
4th Experimental	12	15	27
4th Control	9	18	27
5th Experimental	13	11	24
5th Control	11	13	24

The Henmon-Nelson Test of Mental Maturity was used to measure mental ability and was administered to both groups. In order to determine whether the experimental and control groups were

equivalent in intelligence, the students' "t" tests were utilized and results reported in Table III.

TABLE III

Significance of Mean Difference in Intelligence of Experimental and Control Subjects

Group	N	Mean	SD	SE_m	D	SE_d	t
All Boy Exp.	25	134.1	10.24	2.04	2.2	3.69	.592
All Boy Cont.	20	131.9	12.83	2.94			
All Girl Exp.	26	134.0	13.65	2.78	.70	3.93	.173
All Girl Cont.	31	133.3	15.16	2.76			
All 4th Exp.	27	134.0	4.20	.26	.00	.00	.00
All 4th Cont.	27	134.0	3.87	.24			
All 5th Exp.	24	134.2	4.13	.27	2.90	1.73	1.68
All 5th Cont.	24	131.3	6.90	1.43			
Total Exp.	51	134.0	12.34	1.74	1.40	3.27	.422
Total Cont.	51	132.6	20.44	2.89			

Since none of the obtained differences between groups are statistically significant the experimental and control groups may be looked upon as equal in intelligence.

The SRA Reading Comprehension and SRA Arithmetic Reasoning were utilized to obtain measures of achievement in reading and arithmetic. In order to determine whether the experimental and control groups were equivalent in achievement, the means of each group were ascertained. The statistical significance of the difference between the obtained means was then analyzed using

the t technique. These data are summarized in Table IV. Since none of the obtained differences between groups are statistically significant the experimental and control groups may be looked upon as equal in achievement in reading and arithmetic.

TABLE IV

Significance of Mean Differences in Reading and Arithmetic Achievement of Experimental and Control Subjects

	N	Mean	SD	SE_m	D	SE_d	t
Reading							
All 4th Exp.	27	6.3	1.69	.33	.50	.364	1.371
All 4th Cont.	27	5.8	.60	.16			
All 5th Exp.	24	8.2	1.01	.21	.30	.766	.391
All 5th Cont.	24	7.9	3.53	.23			
Arithmetic							
All 4th Exp.	27	6.5	1.15	.22	.20	.266	.755
All 4th Cont.	27	6.7	.72	.14			
All 5th Exp.	24	7.8	2.23	.46	.40	.710	.555
All 5th Cont.	24	7.4	2.62	.54			

Table V is a descriptive classification of the occupations of the fathers of the experimental anc control groups. In equating occupational categories the aim was to equalize the socio-economic level of the groups as much as possible in order to exclude this factor as a variable in drawing conclusions about the differences between groups. Beckman (Aptitudes and Aptitude Testing, p. 92, W.V.Bingham)[1] prepared a listing of occupations based upon the prestige accorded to workers in various fields and, at the same

time, classified these according to the intelligence capacity, skill, and training required for their pursuit. The five categories suggested by Beckman and used by the writer as a suitable system for organizing the data pertaining to the fathers' occupations follow:

I Unskilled Manual Occupations

II Semi-skilled Occupations

III (a) Skilled Manual Occupations
(b) Skilled White-Collar Occupations

IV (a) Sub-professional Occupations
(b) Business Occupations
(c) Minor Supervisory Occupations

V (a) Professional (Linguistic) Occupations
(b) Professional (Scientific) Occupations
(c) Managerial and Executive Occupations

The occupational classifications of the fathers of the experimental and control groups are listed in Table V. By inspection the groups appear to be equal.

TABLE V

The Occupational Classifications of the Fathers of the Experimental and Control Groups

Group	I	II	III	IV	V
Experimental	-	8	13	12	18
Control	-	10	11	10	20

c. Testing and Other Evaluative Devices....In order to obtain measures of problem-solving abilities, test scores of the Sequential Tests of Educational Progress (STEP) in Science and Language Arts were utilized. These tests were administered to both the experimental and control subjects. Form 4A was administered to both groups prior to the commencement of the summer program and Form 3A was administered to both groups upon the completion of the program. The STEP Science Tests were designed to measure ability to use scientific knowledge to solve problems. The STEP Reading Test measures the ability to reproduce ideas, ability to translate ideas and make inferences, ability to analyze motivation, presentation and ability to criticize.

In order to obtain data dealing with changes in operant-need level, the Self-Description Form Cx was utilized. This test was also administered to both experimental and control groups prior to and upon completion of the summer program. The Self-Description Form Cx was developed by the staff of the Educational Research Center, School of Education, University of Buffalo. It was designed to measure operant needs which included the following ten psychological needs: affiliation, dominance, autonomy, succorance, stimulation, nurturance, aggression, deference, achievement, and compulsivity.

The selection factors considered in this study included mental ability which was measured by the Henmon-

Nelson Tests of Mental Ability. Measures of achievement were obtained by the SRA Tests of Reading Comprehension and Arithmetic Reasoning.

Success in the program was measured by the use of a ranking procedure (Success Rating Scale) which teachers used to rate the experimental subjects in the following four areas: (a) Teacher preference for students, (b) Independent functioning, (c) Ability to work in both academic areas, (d) Student motivation. A copy of this rating scale can be found in Appendix B.

d. Procedure in Treating Data....The data obtained, according to the procedures indicated above will be grouped and treated in various ways to provide a resolution of the questions stated in the section dealing with the problem under study.

Question 1:

In order to determine ability in problem-solving techniques in the areas of Science and Language Arts for both control and experimental subjects, scores on the STEP Science and Language Arts tests will be utilized.

The results for fourth and fifth grades, boys and girls, control and experimental, were obtained on the pre- and post-testing. Difference scores (post minus pre) for all groups will be submitted to a 2 x 2 x 2 non-proportional Analysis of

Variance. This will be done in order to determine whether the means of these groups differ significantly among themselves. An Analysis of Variance (or F test) was used in order to determine the ratio of the variance between groups and the variance within groups in order to decide whether the sets could have arisen by random sampling from the same population.

Question 2:

In order to determine whether there was a reduction in the operant-need level of the experimental subjects as compared to the control subjects, the Self-Description Form Cx was utilized. Scores were obtained for both groups on pre- and post-testing and difference scores recorded. These were analyzed by grade, sex, and experimental-control sub-groups. Again a 2 x 2 x 2 non-proportional Analysis of Variance was done to determine whether the means of the above groups differ significantly among themselves. An Analysis of Variance (or F test) was used in order to determine the ratio of the variance between groups and the variance within groups in order to decide whether the sets could have arisen by random sampling from the same population.

Question 3:

In order to determine which selection factors (age, sex, intelligence, reading comprehension, arithmetic reasoning) are related to success in the experimental program, product-moment correlations between these factors and teachers' ratings will be determined. Scores for intelligence will be obtained from the Henmon-Nelson Test of Mental Ability and Achievement Scores from the SRA Tests of Reading Comprehension and Arithmetic Reasoning. Success in the program will be measured by use of a ranking procedure (Success Rating Scale) which teachers used to rate experimental subjects.

Question 4:

In order to determine whether there is a relationship between changes in problem-solving ability and operant-need level, product-moment correlations will be obtained. These correlations will be done between the difference scores on the STEP tests and Self-Description Form Cx for all experimental subjects.

C. Analysis of Data

Results: The data and conclusions obtained as a result of this study will be presented as they relate to the specific questions stated previously:

Question 1: Do gifted children in the experimental

summer program develop greater ability in problem-solving techniques in the areas of Science and Language Arts than do control subjects?

The data derived from the pre- and post-testing of the experimental and control groups with the STEP Language Arts and Science tests are utilized to answer Question One. The raw scores for each subject are presented in Tables XXXI through XXXIV of the Appendix. The difference between post- and pre-test scores (Post-Score minus Pre-Score) for each subject was used to determine changes in problem-solving ability.

Table VI present the number of subjects, means and standard deviations for the experimental and control groups, by grade and sex, with regard to the difference scores of the STEP Science test.

TABLE VI

Means and Standard Deviation for Difference Scores
STEP Science - Control and Experimental Groups

Group	Grade	Sex	N	Mean	SD
Experimental	4	F	15	3.800	6.56
Control	4	F	18	1.22	5.96
Experimental	5	F	11	5.54	12.67
Control	5	F	13	1.92	5.08
Experimental	4	M	12	3.17	8.98
Control	4	M	9	.89	5.17
Experimental	5	M	13	3.46	6.85
Control	5	M	11	2.73	7.32

The difference scores obtained from the experimental and control groups were then submitted to an analysis of variance. The results of this analysis of the data are summarized in Table VII.

TABLE VII

Analysis of Variance of Difference Scores, STEP Science for Experimental and Control Subjects.

Source of Variation	SS	df	Mean Squares	F
I Experimental-Control	95.66	1	95.66	1.55
II Grade	177.97	1	177.97	2.89
III Sex	207.64	1	207.64	3.37
I x II	110.72	1	110.72	1.79
I x III	5.39	1	5.39	.09
II x III	64.91	1	64.91	1.05
I x II x III	205.80	1	205.80	3.34
Within Groups	5,795.13	94	61.66	
TOTAL	6,730.35	101		

For statistical significance, an F of 6.93 would be necessary at the .01 level of confidence and F of 3.95 would be necessary at the .05 level of confidence.

As far as our specific question was concerned the non-significant F ratio of 1.55 for the Experimental-Control difference does not warrant the conclusion that the summer program yielded superior gains in STEP Science.

Since the F ratios do not reach a statistically significant level, it is evident that the mean difference scores in Science problem solving of experimental and control subjects, fourth and fifth grade subjects and boys and girls do not differ significantly, nor wo any of the other interactions studied.

A similar analysis of the data was done for problem solving in the area of Language Arts as measured by the STEP tests. Table VIII presents the number of subjects, means, and Standard Deviations for the experimental and control groups, by grade and sex with regard to the difference scores of the STEP Language Arts tests.

TABLE VIII

Means and Standard Deviations for Difference Scores, STEP Language Arts, Control and Experimental Groups.

Group	Grade	Sex	N	Mean	SD
Experimental	4	F	15	2.400	11.15
Control	4	F	18	.722	9.47
Experimental	5	F	11	5.18	10.76
Control	5	F	13	10.62	16.50
Experimental	4	M	12	.42	9.14
Control	4	M	9	5.89	9.12
Experimental	5	M	13	4.00	6.64
Control	5	M	11	8.00	6.24

The difference scores obtained from the experimental and control groups for problem solving in the area of language arts were then submitted to an analysis of variance, the results of which are summarized in Table IX.

TABLE IX

Analysis of Variance of Difference Scores, STEP Language Arts for Experimental and Control Subjects.

Source of Variation	SS	df	Mean Squares	F
I Experimental-Control	421.34	1	421.34	3.58
II Grade	928.16	1	928.16	7.89*
III Sex	48.56	1	48.56	.41
I x II	7.99	1	7.99	.07
I x III	8.52	1	8.52	.07
II x III	267.82	1	267.82	2.28
I x II x III	41.89	1	41.89	.36
Within Groups	111,047.73	94	117.53	
Total	12,964.84	101		

*significant at .01 level

Again, as far as our specific question was concerned, the non-significant F ratio for the Experimental-Control differences indicates no superior gains in STEP Language Arts as a result of the summer program. The only F ratio to reach significance was that which reflects grade differences in gains in Language Arts problem solving. An examination of Table VIII indicates that for each group the fifth grade mean difference scores were higher than fourth grade mean difference scores.

An inspection of the other sources of variation within the experimental study such as differences between experimental and control groups, sex differences, etc., indicated no significant

difference and it can be concluded that there were no differences in problem-solving ability in this area as a result of this experiment.

This conclusion of no significant difference in problem-solving ability in the areas of Science and Language Arts is based upon the findings obtained using the STEP tests which, to a large extent, are basically tests of achievement. Lack of difference in this area might be obtained for two reasons:

1. The length of the program (six weeks, three hours per day) would be limiting in changes in measurable achievement on standardized tests.
2. The experimental program's emphasis was not on acquisition of factual information but on skills and attitudes in the areas of independent study, individual research projects and problem-solving ability.

Question 2:

Do gifted children in the experimental summer program manifest a reduction in their operant-need level as compared to the control group?

The data derived from the pre- and post-testing of the experimental and control groups with the Self-Description Form Cx (Needs Test) are utilized to answer Question Two. The raw scores for each subject are presented in Tables XXXI through XXXIV of the Appendix. The difference between post minus pre-test scores for each subject was used to determine changes in operant-need level.

Tables X, XI, XII, and XIII present the number of subjects, means and standard deviations for the experimental and control groups by grade and sex with regard to the difference scores for the three sub-tests and total scores of the Self-Description Form. The negative means which were obtained indicate a general reduction in need expression. The three sub-tests previously mentioned measure the following three factors:

a) need for Freedom
b) need for Culture Conformity
c) Self-Reliance versus Dependence

The total score is a measure of these three factors plus a sub-test which purports to measure need for Stimulation.

TABLE X

Difference Scores for Need for Freedom Cluster

Group	Grade	Sex	N	Mean	SD
Experimental	4	F	15	-11.07	15.27
Control	4	F	18	-10.44	11.50
Experimental	5	F	11	- 7.73	10.67
Control	5	F	13	- 3.77	11.95
Experimental	4	M	12	- 8.17	8.905
Control	4	M	9	- 3.89	8.39
Experimental	5	M	13	-10.62	13.65
Control	5	M	11	- 5.73	8.42

TABLE XI

Difference Scores for Need for Cultural Conformity Cluster.

Group	Grade	Sex	N	Mean	SD
Experimental	4	F	15	-11.07	8.88
Control	4	F	18	- 5.44	12.59
Experimental	5	F	11	- 6.00	12.87
Control	5	F	13	- 2.77	11.63
Experimental	4	M	12	-11.92	8.99
Control	4	M	9	3.22	8.19
Experimental	5	M	13	5.07	8.72
Control	5	M	11	6.09	7.03

TABLE XII

Difference Scores for Need for Self-Reliance vs. Dependence Cluster

Group	Grade	Sex	N	Mean	SD
Experimental	4	F	15	-11.53	9.72
Control	4	F	18	- 5.89	11.59
Experimental	5	F	11	- 5.64	11.99
Control	5	F	13	- 2.85	10.81
Experimental	4	M	12	- 9.58	8.19
Control	4	M	9	- 3.33	7.12
Experimental	5	M	13	- 6.62	9.90
Control	5	M	11	- 6.45	6.92

TABLE XIII

Difference Scores for Total Needs Test....

Group	Grade	Sex	N	Mean	SD
Experimental	4	F	15	-33.67	29.06
Control	4	F	18	-22.88	28.36
Experimental	5	F	11	-19.36	33.33
Control	5	F	13	- 9.38	32.02
Experimental	4	M	12	-30.50	24.45
Control	4	M	9	-10.44	21.02
Experimental	5	M	13	-23.85	29.11
Control	5	M	11	-18.27	16.99

The difference scores obtained from the experimental and control groups from the previous Tables X through XIII were subjected to an analysis of variance.

TABLE XIV

Analysis of Variance of Difference Scores, Self-Description Form CX for Experimental and Control Subjects -- Freedom Cluster

Source of Variation	SS	df	Mean Squares	F
I Exp.-Cont.	289.47	1	289.47	1.98
II Grade	50.23	1	50.23	.34
III Sex	32,56	1	32.56	.22
I x II	23.85	1	23.85	.16
I x III	32.19	1	32.19	.22
II x III	313.36	1	313.36	2.14
I x II x III	11.38	1	11.38	.08
Within Groups	13773.68	94	146.53	
Total	14553.65	101		

TABLE XV

Analysis of Variance of Difference Scores, Self-Description Form CX for Experimental and Control Subjects -- Cultural Conformity

Source of Variation	SS	df	Mean Squares	F
I Exp.-Cont.	418.75	1	418.75	3.67
II Grade	210.18	1	210.18	1.84
III Sex	1.60	1	1.60	.01
I x II	224.25	1	224.25	1.97
I x III	2.11	1	2.11	.02
II x III	21.75	1	21.75	.19
I x II x III	82.04	1	82.04	.72
Within Groups	10723.99	94	114.08	
Total	111716.87	101		

TABLE XVI

Analysis of Variance Difference Scores, Self-Description Form CX for Experimental and Control Subjects - Self-Reliance vs. Dependence Cluster

Source of Variation	SS	df	Mean Squares	F
I Exp.-Cont.	337.65	1	337.65	3.17
II Grade	118.26	1	118.26	1.11
III Sex	.01	1	.01	.01
I x II	122.55	1	122.55	1.15
I x III	6.26	1	6.26	.06
II x III	126.63	1	126.63	1.19
I x II x III	16.02	1	16.02	.15
Within Groups	9998.47	94	106.37	
Total	10768.67	101		

TABLE XVII

Analysis of Variance Difference Scores, Self-Description Form CX - Total Score for Experimental and Control Subjects

Source of Variation	SS	df	Mean Squares	F
I Exp.-Cont.-	3375.82	1	3375.82	4.07*
II Grade	1041.86	1	1041.86	1.25
III Sex	4.34	1	4.34	.005
I x II	384.18	1	384.18	.46
I x III	28.57	1	28.57	.03
II x III	1237.91	1	1237.91	1.49
I x II x III	264.02	1	264.02	.32
Within Groups	78036.06	94	830.17	
Total	84481.58	101		

*Significant at .05 level.

An analysis of the results reported in Tables XIV through XVII indicates that the F ratios obtained reached a significant level only as a result of the experimental summer program on total need operancy. The findings indicated that the experimental group scored significantly lower at the .05 level of confidence than did the control group. Inspection of the other findings for the three sub-tests also indicated lower mean scores for experimental than control subjects in each category. Although none reached levels which were statistically significant, these results were in the direction of reduced needs for the experimental group. It was only when the total scores were compared that actual differences were obtained at a .05 level of confidence which possibly reflects the greater reliability of pooled scores. The findings therefore indicate that the subjects in the experimental summer program manifest a reduction in their operant-need level as compared to the control subjects. Thus, it can be tentatively concluded that as a result of the experimental program one of the major goals which was to satisfy certain needs in gifted children had been satisfactorily achieved.

Question 3:

Which selection factors (age, sex, intelligence, reading comprehension, arithmetic reasoning) are related to success in the summer program?

In order to obtain ratings of success for the experimental subjects in the summer program the teachers were asked to

rank the children by use of the Success Rating Scale, Appendix B. The results of the ranking for all fifty-one experimental subjects are given in Tables XV through XVIII in the Appendix. These rankings were correlated with the following factors:

1) Sex
2) Grade
3) Age (months)
4) I.Q. (Henmon-Nelson)
5) Reading Comprehension (SRA Achievement Test)
6) Arithmetic Reasoning (SRA Achievement Test)

Table XVIII presents the results of Product-Moment Correlation between the six factors used for selection and success rank obtained for the fifty-one subjects at the end of the summer program.

TABLE XVIII

Product-Moment Correlations -- Selection Factors and Success Rating for Fifty-One Experimental Subjects.

Variable	Success Correlation
Sex	-.162
Age	-.212
Grade	-.292*
I.Q.	-.224
Reading Comp.	-.156
Arithmetic Reas.	-.284*

*Significant at the .05 level - two-tailed test

All correlation coefficients obtained were negative and in only two cases did they reach a level of statistical significance; they were Correlations with Grade and Arithmetic Reasoning. Both were of such a low order that the conclusion

obtained is that in these two cases the relationship found was statistically significant but low in rank order.

Since all children in the summer program were similar in respect to I.Q. and achievement scores in reading and arithmetic because of the select population (see selection factors, page 10), it could be expected that these would be non-differentiating in regard to success. The slight relationship found indicates that for the lower grade (fourth) there was greater success. It was also found that for lower arithmetic reasoning there was greater success. The fact that success is somewhat grade related in this fashion is further supported by the negative correlations with age and reading comprehension. As a result of these findings it can be safely concluded that Fourth Grade subjects benefited at least as much as those in the Fifth Grade. However, the findings of no significant relationship between success in the program and sex, age and grade require further discussion. These findings are meaningful since there was initial concern about the result of combining age ranges, grade levels and boys and girls in a similar program. It was believed that certain children might have advantages in working groups or individual projects. It was suggested that boys would do better in experimental work; older children would have naturational advantages in success in independent learning and problem-solving and that, in general, Fifth Grade pupils would be more able in their overall abilities and functioning than

than Fourth Grade pupils. The experimental findings reported above indicate that, in fact, the Fifth Grade pupils did not do as well as the Fourth Grade in measures of success at the end of the experimental program.

Question 4:

Is there a relationship between changes in problem-solving ability and operant-need level in the experimental subjects?

The data derived from the pre- and post-testing of the experimental and control subjects with the Self-Description Form CX (Needs Test) and the STEP Science and Language Arts Tests were utilized to answer Question Four. The difference scores (post- minus pre-testing) for subjects were used to determine changes in operant-need level and problem-solving ability.

Tables XIX and XX presents the results of Product-Moment Correlation Coefficients for the Control subjects.

TABLE XIX

Product-Moment Coefficient Correlations Between STEP Science and Self-Description Form CX, Control Group

Group	No.	(NEEDS) (3)	(4)	(5)	(6)
Grade 4	27	-.1176	.145	.045	.019
Grade 5	24	-.025	.059	-.093	.021
Boys	31	-.181	.105	-.076	-.068
Girls	20	.053	.151	.115	.126
Total	51	-.061	.105	-.019	.005

TABLE XX

Product-Moment Coefficient Correlations Between STEP Language Arts and Self-Description Form CX - Difference Scores, Control Group

Group	No.	(N E E D S) (3)	(4)	(5)	(6)
Grade 4	27	-.297	-.042	-.224	-.231
Grade 5	24	.613*	.519*	.641*	.663*
Boys	31	.316	.351	.287	.372**
Girls	20	-.212	-.290	-.091	-.242
Total	51	.222	.229	.213	.262

*Significant at .01 level - two-tailed test
**Significant at .05 level

Inspection of Table XIX which gives the correlation between Science problem solving and Operant-Need level for control groups indicate coefficients ranging between -.181 and +.151. When submitted to a two-tailed test of significance none of these correlations reached a statistically significant level and the range of coefficients found indicates no relationship between Science problem solving and any of the needs areas in regard to changes for the control group.

Inspection of Table XX which reports the correlation between Language Arts problem solving and operant-need level changes indicates that at the fifth grade level correlation with all sub-tests and total needs scores, the coefficients were statistically significant and at a level which indicates a moderately positive relationship between these factors. This was found to be also true for the group of male control subjects.

Tables XXI and XXII present the results of Product-Moment Correlation Coefficients for the Experimental Subjects.

TABLE XXI

Product-Moment Coefficient Correlations Between STEP Science and Self-Description Form CX - Difference Scores, Experimental Group.

Group	No.	(NEEDS) (3)	(4)	(5)	(6)total
Grade 4	27	.052	.139	.052	.092
Grade 5	24	-.102	-.316	-.184	-.219
Boys	26	.008	-.018	-.044	-.018
Girls	25	-.069	-.063	.008	-.048
Total	51	-.019	-.029	-.016	-.027

TABLE XXII

Product-Moment Coefficient Correlations Between STEP Language Arts and Self-Description form CX - Difference Scores, Experimental Group

Group	No.	(NEEDS) (3)	(4)	(5)	(5)total
Grade 4	27	.039	.193	.141	.123
Grade 5	24	-.048	-.025	-.042	-.035
Boys	26	.019	.149	.105	.097
Girls	25	-.013	.181	.116	.096
Total	51	.008	.162	.112	.097

The correlation coefficient in Tables XXI and XXII were submitted to a two-tail test of significance and none reached a level of confidence which would indicate other than chance relationship. In addition, the range of coefficients -.316 to +.193 were of such a low order as to indicate no

relationship in the experimental group between changes in problem solving in Science and Language Arts and changes in operant-need level in any of the categories investigated.

The reason for the correlation in Grade Five and male Control Groups between increased needs and increased problem-solving ability in Language Arts is obscure. However, in the light of the fact that eighty correlations were computed for the Experimental and Control groups the finding that only five (5) "were significant" may be argued to be a chance result. If these results are not too discounted they go directly counter to the findings of the Farr and Hausdorff(3) which indicated a causative relationship between high need score and low achievement score. It is felt that further research is needed to clarify this issue.

D. Summary and Implications

The findings previously reported will be discussed in this section under the four major questions originally stated. Implications and practical applications will be stated under each heading and a final section will discuss recommendations for future research.

....Summary and Implications of "Problem Solving" Data

One of the major implications drawn from the results of this study indicated that there was no change in problem-solving

ability in the areas of Science and Language Arts as measured by the STEP tests. Since these are basically tests of achievement it may be that in such a short period of time (six weeks, approximately three hours a day) no significant changes in this area could be expected. In addition, since the initial testing placed subjects high in these areas it was felt that the limits of the test itself might have precluded obtaining an adequate appraisal of this area. It was previously suggested that the major goal of the experimental program was for the subjects to develop skills and motivation in the area of independent study, individual research projects and problem solving. It might well be that other measurement tools might have been more appropriate for determining experimental changes in this area.

The only areas of statistically significant change noted in the section dealing with analysis of the data was in grade-level differences in Language Arts. The fifth grade mean difference scores were higher for both experimental and control groups and this change cannot therefore be attributed to the experimental program.

...Summary and Implications of "Self-Description Form CX" Data

It was with the use of the above-mentioned test instrument that the major findings of this study were obtained. Based upon a theoretical position that motivation is an important variable related to learning, this study focused interest primarily on this area. In particular, motivation was con-

sidered to include the psychological construct "need." In the context of this study it refers to an organismic state implying disequillibrium or an unmet desire or expectation which directs the organism into some form of behavior. The present theory assumes that if behavior leads to a reduction of need(s) the organism will tend to repeat this behavior which infers that learning has occurred.

The program was designed specifically to remove the structure and organization of the typical classroom setting in order that gifted children might explore areas of learning in a new and unique fashion. The size of groups was small and teachers served primarily as consultants and guides. Freedom of choice regarding area of interest was encouraged and projects were developed entirely by the pupils. This environmental and organizational setting was described as a non-structured learning situation.

The data obtained indicated that in measures of total need operancy the students involved in the summer program scored significantly lower on the "Self-Description Form CX." Thus, it can be concluded that this type of experience resulted in the lowering of total operating needs. The implications of such findings are far reaching as they pertain to the everyday classroom situation. Reduction of class size to the very low teacher-pupil ratio of the program (approximately ten to one) is certainly impractical. However, the methods of encouraging independent learning and instruction through guidance and consultation rather than

through more formal didactic instruction, i.e. lecturing, may prove rewarding approaches for reduction of needs which may well take primacy in regard to learning and achievement. In addition, with the renewed interest at present in the area of creativity it may well be that the concern with need reduction will have close ties with freedom to utilize creative thinking processes. Further research in this area is required.

....Summary and Implications of "Selection Factors" Studied

One result of this study was the finding that the correlation between success in the program and all selection factors (sex, grade, I.Q. scores, Reading Comprehension scores and Arithmetic Reasoning scores) were all found to be negative. It was concluded that those at lower grade and with lower scores on arithmetic and reading tended to do better. Thus the results support the mixing of different grade levels of gifted children in such a program. It can be concluded that the fourth grade children did at least as well as fifth graders, if not better, in this experimental program. Such findings suggest that it might be possible to bring together groups of gifted children from several grade levels during the regular school year for specialized programs and experiences. The findings suggest that those at lower grade levels and achievement levels would certainly be able to profit from these experiences and not be particularly handicapped as might have been expected.

Some additional comments regarding the specific factors used in selection should be noted. Since in all cases the degree of correlation obtained was either very low or non-significant, it is felt that none of the factors used was specifically useful in predicting success in the program. In this study teacher recommendations were intentionally not used. It was planned that in future research, additional factors would be studied. A proposal for future research in this area calls for the use of teacher recommendations as an additional selection procedure.

....Summary and Implications of "Problem-Solving Ability" and "Operant-Need Level" Data

Of the eighty product-moment correlations obtained between Difference Scores for Problem Solving and Operant-Need Level, only five (5) were found to be significant. These included a relationship between increased needs and increased problem-solving ability in Language Arts. As previously stated the reason for these results are obscure and are counter to other findings published in the literature. Before any conclusions can be drawn from such data additional research is needed.

...Suggestions for Further Research

In the final section dealing with future research activities a summary of a proposal for continuation of this project is presented. In addition several other research proposals are suggested below:

1) A follow-up study using the Self-Description Form CX to determine whether the measured need reduction persists

after six months, one year, etc.

2) An experimental project during the regular school year in which similar testing would be carried on.

3) An experiment in which three groups would be studied. The first group would be comprised of children in the experimental program, the second group would be children who were selected for the summer program and notified of their selection but who could not attend because of other commitments and a final matched group who were not told anything. This study would indicate the social and psychological effects of being selected for a specialized gifted program.

4) Additional studies dealing with measures of achievement, problem solving and need reduction utilizing additional and different measurement tools.

E. Plans for Future Work

As a result of the findings and conclusions of the present research, a report detailing a proposal for a second-year follow-up study has been submitted to the State Education Department. This application to the Commissioner of Education for continuation of state aid for an experimental program entitled, "Meeting Needs of Gifted: A Non-Structured Summer Program," is used as the basis for this section dealing with recommendations and future work in this area. In this proposed study the investigator will attempt to explore the possible benefits in two areas derived by gifted elementary

students as a result of their participation in a special summer program.

The proposed investigation will focus on the efficacy of the program in reducing the operant needs and in enhancing the creative thinking processes of gifted students. Moreover, the study will seek to determine what relationship, if any, exists between the reduction of specific clusters of operant needs and the growth in creative thinking processes which include such factors as originality, divergent production, problem solving and organizing ability.

All too often an evaluation of the educational goals of a curriculum is geared to the objective achievement results that measure the increased cognitive acquisitions made by the students. While this is certainly a meaningful endeavor, other indices of growth patterns are likewise important for researchers to appraise. This is particularly the case with a program designed to offer gifted students opportunities for independent research into areas of their own interest where creative thinking and problem-solving processes are stressed. Hence, the need was felt to explore more closely the contribution that a non-structured summer program could make on the creative thinking processes of students who demonstrated high I.Q. and school achievement.

Guilford's (4) theoretical model of the structure of the intellect identifies over 120 factors. Not all of these factors are related to creative thinking, however. While he and his colleagues originally investigated some of the

personality factors, they eventually abandoned the personality traits and concentrated in the direction of intellectual factors. When they refer to "flexibility," they are talking about flexibility in thinking as an intellectual factor, rather than flexibility as a personality trait. Looking at this issue, it is sometimes difficult to say where one ends and the other begins. There is a continuing need to investigate the close alliance between personality factors and intellectual factors, so that research into the change in one area will shed some light on both.

The relationship between operant-need satisfaction and creative thinking processes in gifted children was chosen as the specific area of investigation because of several determining indicators.

1. Previous studies with gifted children indicate that a significant negative relationship exists between operant needs and achievement.(3)

2. Operant-need satisfaction can be achieved through a non-structured summer program with gifted children.(7)

3. There are some indications that reduction in operant needs is related to better classroom performance.(8)

These findings suggest that operant needs lead to behavior specifically aimed to reduce these needs and that this behavior may be in conflict with behavior necessary for more abstract, creative and original thinking. Consequently, it is likely that reduction of personal operating needs in an individual can free him to engage in behavior leading to improved

creative thinking processes.

Therefore, the plans for future work in this area are designed to explore the following specific questions:

1. Will the summer program continue to show significant reduction in operant needs in the experimental students as compared with the control subjects?

2. Can a non-structured summer program serve to significantly increase the creative thinking processes of the experimental students as compared with the control students?

3. Is there a relationship between the reduction of operant needs in the experimental students and increased creative processes?

4. Is success in the summer program related to increased creative thinking ability?

It is hoped that continued research in the area of reduction of needs which impedes behavior, intellectual achievement and creative thinking will shed additional light on the problem of education for the gifted.

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APPENDIX

APPENDIX A

TABLE XXIII

Sex, Age, I. Q. and Achievement of

Fourth Grade Experimental Subjects

Subject	Sex	Age as of 6/62 in Months	H-H I.Q.	SRA Read. Compreh.	SRA Arith. Reasoning
1	F	113	130	7.2	7.4
2	F	120	131	7.3	5.8
3	F	122	130	5.9	5.8
4	F	128	133	6.8	6.4
5	F	128	134	6.4	6.4
6	F	120	133	6.8	5.8
7	F	123	131	6.2	7.3
8	F	127	134	6.8	7.3
9	F	124	132	5.9	6.4
10	F	121	134	5.9	7.3
11	F	124	139	6.4	5.8
12	F	124	130	6.8	5.8
13	F	128	135	5.7	5.3
14	F	121	132	6.2	6.4
15	F	128	131	5.9	6.4
16	M	131	133	5.9	5.8
17	M	126	130	5.5	6.4
18	M	129	135	6.4	7.3
19	M	120	144	5.2	7.3
20	M	110	138	6.2	6.2
21	M	120	130	6.4	7.3
22	M	124	131	5.5	6.4
23	M	120	134	6.8	6.4
24	M	119	148	5.5	5.3
25	M	121	133	6.4	7.3
26	M	121	135	6.8	5.8
27	M	126	137	7.3	6.4

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TABLE XXIV

Sex, Age, I. Q. and Achievement of

Fifth Grade Experimental Subjects

Subject	Sex	Age as of 6/62 in Months	H-N I.Q.	SRA Read. Compreh.	SRA Arith. Reasoning
1	F	141	133	7.0	7.3
2	F	133	132	6.8	9.6
3	F	136	143	7.7	9.0
4	F	139	131	7.7	7.3
5	F	133	135	7.0	8.4
6	F	140	145	7.5	6.6
7	F	139	130	7.0	6.2
8	F	139	139	6.8	6.8
9	F	137	143	9.6	10.0
10	F	139	132	9.6	9.6
11	F	140	132	9.3	7.8
12	M	139	134	10.3	8.7
13	M	123	133	8.0	6.9
14	M	136	132	9.6	7.8
15	M	135	136	8.7	7.9
16	M	128	135	7.2	8.7
17	M	133	130	8.7	8.1
18	M	138	132	7.7	6.6
19	M	136	132	8.2	6.8
20	M	139	134	8.5	7.3
21	M	140	135	9.3	7.8
22	M	135	130	8.5	7.8
23	M	133	130	7.7	7.8
24	M	132	135	9.3	7.3

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TABLE XXV

Sex, Age, I. Q. and Achievement of

Fourth Grade Control Subjects

Subject	Sex	Age as of 6/62 in Months	H-N I.Q.	SRA Read. Compreh.	SRA Arith. Reasoning
1	F	124	128	6.1	6.3
2	F	131	130	5.5	6.4
3	F	125	136	5.7	6.4
4	F	124	137	5.2	6.4
5	F	121	134	5.9	7.3
6	F	131	135	6.2	6.4
7	F	124	131	5.9	7.3
8	F	118	142	4.5	6.4
9	F	114	137	5.9	7.3
10	F	129	136	5.9	5.3
11	F	122	134	5.2	6.0
12	F	127	138	5.2	7.3
13	F	131	133	5.9	7.3
14	F	114	134	6.7	8.3
15	F	131	135	5.9	6.0
16	F	123	138	5.5	5.3
17	F	131	133	5.2	7.3
18	F	129	128	5.5	6.4
19	M	127	137	5.5	7.3
20	M	113	139	5.2	6.2
21	M	139	128	6.8	7.3
22	M	122	129	6.8	5.8
23	M	128	129	6.2	7.3
24	M	127	135	5.2	7.3
25	M	120	140	5.9	5.8
26	M	134	130	7.3	7.3
27	M	134	131	5.7	6.4

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TABLE XXVI

Sex, Age, I.Q. and Achievement of

Fifth Grade Control Subjects

Subject	Sex	Age as of 6/62 in Months	H-N I.Q.	SRA Read. Compreh.	SRA Arith. Reasoning.
1	F	137	136	8.0	5.2
2	F	124	130	5.2	8.3
3	F	138	125	8.5	8.4
4	F	140	128	8.0	6.8
5	F	140	127	8.0	8.1
6	F	139	132	6.6	6.3
7	F	142	147	9.0	7.8
8	F	133	131	6.8	7.8
9	F	142	128	6.7	6.2
10	F	139	146	9.0	5.9
11	F	136	127	7.8	7.6
12	F	132	127	7.2	6.9
13	F	132	128	7.2	6.6
14	M	141	127	8.0	8.1
15	M	135	126	8.0	6.3
16	M	124	128	7.2	6.6
17	M	151	128	8.7	9.0
18	M	140	134	7.0	8.7
19	M	135	134	8.5	7.5
20	M	139	127	9.0	9.0
21	M	126	129	8.0	6.6
22	M	134	126	8.2	6.9
23	M	127	151	8.7	9.3
24	M	139	129	9.0	6.8

APPENDIX A

TABLE XXVII

Pre and Post STEP Scores and Language Arts Scores

of Fourth Experimental Subjects

Subject	STEP Science Pre	STEP Science Post	STEP Language Pre	STEP Language Post
1	266	263	279	271
2	284	273	275	289
3	280	265	275	283
4	268	263	270	262
5	275	272	293	292
6	267	266	268	277
7	252	260	275	260
8	264	261	290	289
9	271	272	275	273
10	267	259	275	247
11	284	267	282	273
12	-	-	-	-
13	266	271	287	281
14	266	267	277	295
15	263	261	272	268
16	262	259	253	257
17	277	285	296	279
18	269	275	287	288
19	293	275	293	288
20	267	270	268	273
21	275	283	279	288
22	271	283	296	295
23	277	274	268	263
24	275	286	287	279
25	271	275	287	296
26	262	266	265	284
27	273	269	293	287

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TABLE XXVIII

Pre and Post STEP Scores and Language Arts Scores

of Fifth Experimental Subjects

Subject	STEP Science Pre	STEP Science Post	STEP Language Pre	STEP Language Post
1	267	262	279	279
2	273	281	287	295
3	237	275	296	302
4	277	280	290	280
5	269	274	296	283
6	263	267	284	289
7	267	273	279	296
8	271	255	290	285
9	275	286	284	300
10	271	281	287	298
11	280	277	266	288
12	288	299	290	302
13	275	274	275	276
14	269	275	293	295
15	267	271	299	290
16	267	273	272	279
17	280	299	293	292
18	277	271	272	285
19	275	277	275	283
20	269	271	279	285
21	297	290	287	299
22	273	269	277	283
23	271	278	299	292
24	277	283	290	292

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TABLE XXIX

Pre and Post STEP Scores and Language Arts Scores

of Fourth Control Subjects

Subject	STEP Science Pre	STEP Science Post	STEP Language Pre	STEP Language Post
1	260	265	268	287
2	256	246	256	259
3	-	-	-	-
4	269	263	268	254
5	271	267	268	273
6	275	266	293	281
7	269	263	-	-
8	260	264	277	279
9	273	267	279	268
10	267	267	247	249
11	269	273	279	283
12	271	265	293	281
13	264	274	287	270
14	267	264	272	283
15	264	266	272	276
16	263	272	282	280
17	269	272	272	284
18	275	267	279	274
19	263	268	279	277
20	273	269	272	284
21	288	288	287	302
22	257	261	261	273
23	275	274	287	276
24	273	264	268	270
25	275	278	272	289
26	288	288	287	298
27	264	274	284	281

APPENDIX A

TABLE XXX

Pre and Post STEP Science and Language Arts Scores

of Fifth Control Subjects

Subject	STEP Science Pre	STEP Science Post	STEP Language Pre	STEP Language Post
1	288	283	296	305
2	284	286	277	300
3	280	280	287	298
4	284	274	277	292
5	275	273	228	290
6	267	270	287	289
7	284	277	293	298
8	288	275	299	299
9	267	269	277	271
10	273	274	-	-
11	271	272	299	298
12	267	271	284	290
13	271	270	268	270
14	288	286	287	287
15	280	286	290	298
16	275	268	265	270
17	284	299	287	295
18	273	273	284	296
19	267	271	275	285
20	277	269	277	293
21	263	265	270	288
22	275	272	279	274
23	297	309	284	293
24	264	275	293	300

APPENDIX A

TABLE XXXI

Difference Scores

STEP and Self-Description Inventory Form CX

Fourth Grade Experimental Subjects

Subject	STEP Science Post-Pre	STEP Lang. Post-Pre	Needs n-Freedom Post-Pre	Needs n-Cultural Conformity Post-Pre	Needs n-Self-Reliance Dependence Post-Pre	Total Needs Post-Pre
1	- 3	- 8	-13	- 3	- 2	-18
2	-11	+14	-14	-25	-13	-52
3	-15	+ 8	0	- 5	- 1	- 6
4	- 5	- 8	-41	-10	-35	-86
5	- 3	- 1	+ 2	-14	-13	-25
6	- 1	+ 9	-52	-19	-26	-97
7	+ 8	-15	- 1	-10	- 6	-17
8	- 3	- 1	- 8	-12	-10	-30
9	+ 1	- 2	- 3	- 1	-11	-15
10	- 8	-28	-18	-30	-22	-70
11	-17	- 9	+ 2	- 5	+ 3	0
12	- 4	- 3	0	- 5	- 2	- 7
13	+ 5	- 6	-12	-22	-12	-46
14	+ 1	+18	- 5	- 5	-13	-23
15	- 2	- 4	- 3	0	-10	-13
1	- 3	+ 4	-14	-28	-29	-81
2	+18	-17	-17	-15	-17	-49
3	+ 6	+ 1	- 9	- 4	- 4	-17
4	-18	- 5	- 5	- 6	- 8	-19
5	+ 3	+ 5	- 4	- 8	- 8	-20
6	+ 8	+ 9	- 9	- 5	+ 2	-12
7	+12	- 1	- 4	- 6	- 7	-17
8	- 3	- 5	- 7	-26	-19	-52
9	+11	- 8	+10	- 3	- 1	+ 6
10	+ 4	+ 9	-13	- 8	- 7	-28
11	+ 4	+19	+ 1	- 8	- 5	-12
12	- 4	- 6	-27	-26	-12	-65

APPENDIX A

TABLE XXXII

Difference Scores

STEP and Self-Description Inventory Form CX

Fifth Grade Experimental Subjects

Subject	STEP Science Post-Pre	STEP Lang. Post-Pre	Needs n-Freedom Post-Pre	Needs n-Cultural Conformity Post-Pre	Needs n-Self-Reliance Dependence Post-Pre	Total Needs Post-Pre
1	- 5	0	-11	- 2	- 4	-17
2	+ 8	+ 8	-13	- 2	- 5	-20
3	+38	+ 6	-13	-20	-15	-48
4	+ 3	-10	-28	-31	-33	-92
5	+ 5	-13	+17	+19	+21	+57
6	+ 4	+ 5	-16	+ 9	- 4	-11
7	+ 6	+17	- 4	- 2	- 7	-13
8	-16	- 5	- 8	-13	- 6	-27
9	+11	+16	- 1	-12	- 5	-18
10	+10	+11	- 2	- 9	- 3	-14
11	- 3	+22	- 6	- 3	- 1	-10
1	+11	+12	-11	- 7	- 5	-23
2	- 1	+ 1	+ 9	- 5	- 2	+ 2
3	+ 6	+ 2	-13	- 2	- 6	-21
4	+ 4	- 9	- 4	- 3	- 5	-12
5	+ 6	+ 7	+ 2	- 9	- 3	-10
6	+19	- 1	-30	-23	-19	-72
7	- 6	+13	-41	- 7	-23	-71
8	+ 2	+ 8	-16	-13	-13	-42
9	+ 2	+ 6	- 8	-14	+ 4	-18
10	- 7	+12	+ 7	+ 2	- 4	+ 5
11	- 4	+ 6	- 6	+14	+11	+19
12	+ 7	- 7	- 5	+ 3	+ 2	0
13	+ 6	+ 2	-22	- 2	-23	-67

APPENDIX A

TABLE XXXIII

Difference Scores

STEP and Self-Description Inventory Form CX

Fourth Grade Control Subjects

Subject	STEP Science Post-Pre	STEP Lang. Post-Pre	Needs n-Freedom Post-Pre	Needs n-Cultural Conformity Post-Pre	Needs n-Self-Reliance Dependence Post-Pre	Total Needs Post-Pre
1	+ 5	+19	-43	- 5	-27	-75
2	-10	+ 3	- 3	-15	- 8	-26
3	- 1	- 1	- 5	+11	- 3	+ 3
4	- 6	-14	-11	- 1	+ 6	- 6
5	- 4	+ 5	-11	-28	-28	-67
6	- 9	-12	-14	+ 2	-10	-22
7	- 6	- 1	+12	+ 3	+ 7	+22
8	+ 4	+ 2	0	+19	- 4	+15
9	- 5	-11	-15	-23	-18	-56
10	0	+ 2	-17	-23	-13	-53
11	+ 4	+ 4	+ 3	- 9	+14	- 2
12	- 6	-12	- 7	- 1	+12	+ 4
13	+10	-17	- 6	- 4	- 5	-15
14	- 3	+11	-26	-15	- 6	-47
15	+ 2	+ 4	-15	- 7	-15	-37
16	+ 9	- 2	-16	-11	- 8	-35
17	+ 3	+12	-10	+16	+ 6	+12
18	- 8	- 5	- 4	- 7	- 6	-17
1	+ 5	- 2	-13	-15	- 7	-35
2	- 4	+12	-14	-15	-15	-44
3	0	+15	-12	- 1	- 1	-14
4	+ 4	+12	- 1	- 6	+ 9	+ 2
5	- 1	-11	+13	+10	+ 2	+25
6	- 9	+ 2	+ 2	+ 2	- 1	+ 3
7	+ 3	+17	+ 1	+ 5	- 5	+ 1
8	0	+11	- 9	- 9	-13	-31
9	+10	- 3	- 2	0	+ 1	- 1

APPENDIX A

TABLE XXXIV

Difference Scores

STEP and Self-Description Inventory Form CX

Fifth Grade Control Subjects

Subject	STEP Science Post-Pre	STEP Lang. Post-Pre	Needs n-Freedom Post-Pre	Needs n-Cultural Conformity Post-Pre	Needs n-Self-Reliance Dependence Post-Pre	Total Needs Post-Pre
1	- 5	+ 9	+ 2	+ 1	+ 1	+ 4
2	+ 2	+23	0	+ 6	- 1	+ 5
3	0	+11	-10	- 1	-11	-22
4	-10	+15	- 6	+ 3	+ 2	- 1
5	- 2	+62	+26	+23	+28	+77
6	+ 3	+ 2	+ 1	0	- 3	- 2
7	- 7	+ 5	- 1	- 7	-15	-23
8	-13	0	- 6	-11	- 3	-20
9	+ 2	- 6	-27	-11	- 6	-44
10	+ 1	+10	-21	-31	-17	-69
11	+ 1	- 1	- 3	- 1	+ 3	- 1
12	+ 4	+ 6	- 2	- 5	-11	-18
13	- 1	+ 2	- 2	- 2	- 4	- 8
1	- 2	0	-11	- 7	-14	-32
2	+ 6	+ 8	+ 4	+ 1	0	+ 5
3	- 7	+ 5	- 4	-18	- 8	-30
4	+15	+ 8	0	+ 3	+ 5	+ 8
5	0	+12	- 5	- 7	- 9	-21
6	+ 4	+10	+13	+ 1	-12	+ 2
7	- 8	+16	- 6	-10	+ 6	-10
8	+ 2	+18	-17	-12	-14	-43
9	- 3	- 5	-15	+ 2	- 7	-20
10	+12	+ 9	-10	- 4	- 5	-19
11	+11	+ 7	-12	-16	-13	-41

APPENDIX A

TABLE XXXV

Weekly Projects

Volcano
Atomic Rockets
Plants
Heart
Atomic Subs
Cat Family
How Humans Use Energy
Animal Growth and Development
Earth Science - Gems
Respiration
Chemical Plant Energy
Eye
Water Power
Nerves of Human Body
Model City
Earthquakes
Solar Energy
Ear
Sulfur
Electroplating
Salts
Child's Growth and Development
Energy - Perpetual Motion
Optical Illusions
Wrestling
Mathematics Progress
Fossils
See-Saw
Embryo of a Baby
Electrical Energy
Radio Activity
Lungs
Crystal Growth
Sun Motor
Steam Engine
Plays
Mural - Earth's Interior
Snow
Steps in Seed Ripening
Mutants and Mutation
Photosynthesis
Human Body News Newspaper
Telephone
Atomic Destruction
Stomach
Glaciers
Blood
Carbohydrates
Telestar
Brain
Hydraulics
Steel
Ultraviolet Light
Flowers
Diamonds
Gravity
Steam Heat
Cactus
Wind
Tennis
Amphibians

Long Range Projects

Telegraph
Tropical Fish
Spiders - Webs
T.V. Set
Horses (Breeds - Anatomy)
Medicine (Bacteria)
Digestive System - Frog - Human
Adapt. to Environment & Hamsters
Dinosaurs
Novel (science fiction)
Evolution of Life and Person of Future
Paper (uses, kinds, etc.)
Puppet Play
Simplest Atoms
"Poems & Short Stories"
Simple Mech. & Elec. Computor Binary System Report
Report-Phases of Moon and Poster
Planets
Radiation Story
Archaeology
Mouse Experiment
Molds
Heart Model
Brain
Miniature Electrical Generating Plant
Volcano
Fresh Water Fish
American Automobile
Loop Antenna
Vegetable Garden
Insects
Rockets
Rabbit
Human Child - Dev.,Conception to Birth
Sweet Potato Growth

APPENDIX B

SUCCESS RATING SCALE

TEACHER'S NAME_____

The child's behavior in the Summer Enrichment program cannot be understood without reference to observations and reactions by his teachers. Accordingly, we are asking teachers to make four observations: one dealing with teacher preferences, one with the child's independent learning behavior, one with the child's ability to become involved in both Science and Language Arts areas, and one with motivation to learn.

ITEM I:

This is a student whom the teacher especially enjoys having in the program. When asked what child you prefer as a member of the program, this is the student who comes most readily to mind. He may or may not be the one who is the most active or productive in the program and he may or may not be the brightest child in the program. But he is liked by you and is the sort of child about whom you are most likely to say, "Of all the children in the program, this is the one I most enjoy."

INSTRUCTIONS:

Please rate the students listed here according to the scheme.

1. Mark H next to the____students whom you would rate higher than the others on this list for the quality described in this item.
2. Mark L next to the_____students whom you would rate lower than the others on this list for the quality described in this item.
3. Mark M for all the others - this is the middle group.
4. Now, circle the H next to the_____students who are especially high.
5. Circle the L, next to the_____students who are especially low.

APPENDIX B

SUCCESS RATING SCALE
(continued)

TEACHER'S NAME_____

The child's behavior in the Summer Enrichment program cannot be understood without reference to observations and reactions by his teachers. Accordingly, we are asking teachers to make four observations: one dealing with teacher preferences, one with the child's independent learning behavior, one with the child's ability to become involved both Science and Language Arts areas, and one with motivation to learn.

ITEM II:

This is the student who decides what area he wants to do research in and who proceeds in his investigation with minimum dependence upon his teacher. His project may or may not be the most outstanding, but it is brought to completion primarily through his own independent effort. While he may or may not demonstrate the ideal method to pursue his investigations, he relies primarily on his own choice or resources in pursuit of information.

INSTRUCTIONS:

Please rate the students listed here according to the scheme.

1. Mark H next to the_____students whom you would rate higher than the others on this list for the quality described in this item.
2. Mark L next to the_____students whom you would rate lower than the others on this list for the quality described in this item.
3. Mark M for all the others - this is the middle group.
4. Now, circle the H next to the_____students who are especially high.
5. Circle the L, next to the_____students who are especially low.

APPENDIX B

SUCCESS RATING SCALE
(continued)

TEACHER'S NAME_____

The child's behavior in the Summer Enrichment program cannot be understood without reference to observations and reactions by his teachers. Accordingly, we are asking teachers to make four observations: one dealing with teacher preferences, one with the child's independent learning behavior, one with the child's ability to become involved in both Science and Language Arts areas, and one with motivation to learn.

ITEM III:

This is the student who is equally "at home" in the areas of Science and Language Arts. He may or may not be the most outstanding student in any one of the areas. This student effectively communicates (in oral or written form) his science research problem technique of investigation and findings. Likewise, when writing creatively, this student includes scientific data. When working independently, he does not spend all his time in one area while avoiding the other.

INSTRUCTIONS:

Please rate the students listed here according to the scheme.

1. Mark H next to the_____students whom you would rate higher than the others on this list for the quality described in this item.
2. Mark L next to the_____students whom you would rate lower than the others on this list for the quality described in this item.
3. Mark M for all the others - this is the middle group.
4. Now, circle the H next to the_____students who are especially high.
5. Circle the L, next to the_____students who are especially low.

APPENDIX B

SUCCESS RATING SCALE
(continued)

TEACHER'S NAME_____

The child's behavior in the Summer Enrichment program cannot be understood without reference to observations and reactions by his teachers. Accordingly, we are asking teachers to make four observations: one dealing with teacher preferences, one with the child's independent learning behavior, one with the child's ability to become involved in both Science and Language Arts areas, and one with motivation to learn.

ITEM IV:

This is the student who is most involved in (excited about) the learning task. When faced with a problem to be solved, a work to be appreciated, he seems to get genuine pleasure from the educational experience. Learning is fun for this child. This does not mean that he is necessarily the brightest student or one with the most sophisticated research skills, although he may be. He may not even be the best liked by his teacher or peers, although again he may be. But there is no doubt that he is interested in the new, enjoys the pursuit of discovery, and is, of all the children in your classes, most eager to learn.

INSTRUCTIONS:

Please rate the students listed here according to the scheme.

1. Mark H next to the_____students whom you would rate higher than the others on this list for the quality described in this item.
2. Mark L next to the_____students whom you would rate lower than the others on this list for the quality described in this item.
3. Mark M for all the others - this is the middle group.
4. Now, circle the H next to the_____students who are especially high.
5. Circle the L, next to the_____students who are especially low.